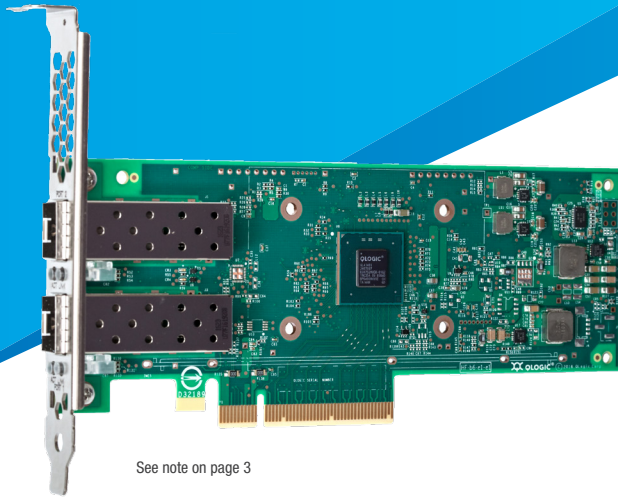


# FastLinQ QL41132HLCU

## 8th Generation 10Gb Ethernet Adapter with Universal RDMA



See note on page 3

- Industry's most powerful 10GbE adapter delivers the best price and performance ratio compared to 10GbE
- Universal RDMA—Delivers choice and flexibility with concurrent support for RoCE, RoCEv2, and iWARP technologies
- Secure firmware update process with private/public key encryption technology prevents hackers from altering adapter
- Increase VM density and accelerate multitenant networks with full offload for tunneling protocols
- Accelerate the most demanding telco NFV workloads with Cavium DPDK high-speed packet processing engine

## OVERVIEW

The FastLinQ® QL41132HLCU Intelligent Ethernet Adapter with Universal Remote Direct Memory Access (RDMA) leverages Cavium™ eighth-generation technology to deliver 10Gbps Ethernet performance. Integrated, advanced networking eliminates I/O bottlenecks and conserves CPU cycles. Optimized for use across enterprises, managed service providers (MSPs), and large public and scalable public cloud deployments, the QL41132HLCU enables organizations to achieve new levels of performance in physical, virtual, and cloud environments.

The 10Gb Ethernet (10GbE) specification enables network bandwidth to be cost-effectively scaled in support of next-generation server and storage solutions residing in cloud and Web-scale data center environments.

FastLinQ QL41132HLCU 10GbE adapters deliver advanced Ethernet solutions that are designed to meet requirements from leading enterprise and cloud providers. Cavium features that collectively deliver the most advanced 10GbE adapter include:

- Cutting-edge server virtualization technologies—single-root I/O virtualization (SR-IOV) and Switch Independent NIC Partitioning (NPAR)
- Network virtualization—offloads for Virtual Extensible LAN (VXLAN), Generic Network Virtualization Encapsulation (GENEVE), and Network Virtualization using Generic Routing Encapsulation (NVGRE)

- Universal RDMA technologies—RDMA over Converged Ethernet (RoCE), RoCEv2, iSCSI Extensions for RDMA (iSER), and Internet wide area RDMA protocol (iWARP)
- Orchestrate and manage hyperscale OpenStack® deployments with Cavium cloud-enabled management framework

### REDUCE CAPITAL EXPENDITURE AND OPERATING EXPENSE

FastLinQ QL41132HLCU 10GbE technology delivers excellent price-per-gigabit value. This technology enables cloud providers and large-scale data center operators to reduce operating expense while continuing to scale their network of server and storage nodes to meet increasing demands of the future.

### ACCELERATE ANY NETWORK WITH UNIVERSAL RDMA OFFLOAD

The FastLinQ QL41132HLCU 10GbE adapter supports RoCE and iWARP acceleration to deliver low latency, low CPU utilization, and high performance on Windows Server® Message Block (SMB) Direct 3.0 and 3.02, and iSER. QL41132HLCU 10GbE adapters have the unique capability to deliver Universal RDMA that enables RoCE, RoCEv2, and iWARP. Cavium Universal RDMA and emerging low latency I/O bus mechanisms such as Network File System over RDMA (NFSoRDMA), and Non-Volatile Memory Express® over Fabrics (NVMe-oF) allow customers to accelerate access

to data. Cavium's cutting-edge offloading technology increases cluster efficiency and scalability to many thousands of nodes.

### HIGH DENSITY SERVER VIRTUALIZATION

The latest hypervisors and multicore systems use several technologies to increase the scale of virtualization. The FastLinQ QL41132HLCU 10GbE adapter supports:

- VMware® NetQueue
- Windows® Hyper-V® Virtual Machine Queue (VMQ)
- Linux® Multiqueue
- Windows, Linux, and VMware switch-independent NPAR
- Windows Hyper-V, Linux Kernel-based Virtual Machine (KVM), and VMware ESXi™ SR-IOV

These features provide ultimate flexibility, quality of service (QoS), and optimized host and VM performance while providing full 10Gbps bandwidth per port. Public and private cloud virtualized server farms can now achieve VM density for the best price and VM ratio.

### WIRE-SPEED NETWORK VIRTUALIZATION

Enterprise-class data centers can be scaled using overlay networks to carry VM traffic over a logical tunnel using NVGRE, VXLAN, and GENEVE. Although overlay networks can resolve vLAN limitations, native stateless offloading engines are bypassed, which places a higher load on the system's CPU. The FastLinQ QL41132HLCU 10GbE adapter efficiently handles this load with advanced NVGRE, VXLAN, and GENEVE stateless offload engines that access the overlay protocol headers. This access enables traditional stateless offloads of encapsulated traffic with native-level performance in the network. Additionally, the FastLinQ QL41132HLCU adapter supports VMware NSX® and Open vSwitch™ (OVS).

### HYPER-SCALE ORCHESTRATION WITH OPENSTACK

The FastLinQ QL41132HLCU 10GbE adapter supports the OpenStack open source infrastructure for constructing and supervising public, private, and hybrid cloud computing platforms. It provides for both networking and storage services (block, file, and object) for iSER. These platforms allow providers to rapidly and horizontally scale VMs over their entire, diverse, and widely spread network architecture to meet the real-time needs of their customers. Cavium's integrated, multiprotocol management utility, QConvergeConsole® (QCC), provides breakthrough features that allow customers to visualize the OpenStack-orchestrated data center using auto-discovery technology.

### ACCELERATE TELCO NETWORK FUNCTION VIRTUALIZATION (NFV) WORKLOADS

In addition to OpenStack, the FastLinQ QL41132HLCU 10GbE adapter supports NFV that allows decoupling of network functions and services from dedicated hardware (such as routers, firewalls, and load balancers) into hosted VMs. NFV enables network administrators to flexibly create network functions and services as they need them, reducing capital expenditure and operating expenses, and enhancing business and network services agility. Cavium 10GbE technology is integrated into the Data Plane Development Kit (DPDK) and can deliver up to 60 million packets per second to host the most demanding NFV workloads.

### TRUSTED, SECURE, RELIABLE, AND INTEROPERABLE

The FastLinQ QL41132HLCU 10GbE adapter adheres to standards that ensure interoperability with a wide range of network solutions. Cavium adapters are secure by design. Through public and private key encryption technology, the adapter enforces a process for secure firmware updates that prevent hackers from altering the code running on the adapter.

## Host Bus Interface Specifications

### Bus Interface

- PCI Express® (PCIe®) Gen 3 x8, Gen 2 x8 (electrical)

### Host Interrupts

- MSI-X

### I/O Virtualization

- SR-IOV (up to 192 virtual functions)
- NPAR (up to 16 physical functions)

### Compliance

- PCI Express Base Specification, rev. 3.1
- PCI Express Card Electromechanical Specification, rev. 3.0
- PCI Bus Power Management Interface specification, rev. 1.2

## Ethernet Specifications

### Throughput

- 10Gbps line rate per-port in 10GbE mode

### Ethernet Frame

- Standard MTU sizes and jumbo frames up to 9,600 bytes

### Stateless Offload

- IP, TCP, and user datagram protocol (UDP) checksum offloads
- TCP segmentation offload (TSO)
- Large send offload (LSO)
- Giant send offload (GSO)
- Large receive offload (LRO)
- Receive segment coalescing (RSC) (Windows)
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Interrupt coalescing
- VMware NetQueue, Microsoft® Hyper-V VMQ, and Linux Multiqueue
- Universal RDMA

### Tunneling Offloads

- VXLAN
- NVGRE
- GENEVE

### Board Firmware Features

- Secure Firmware Update process

## Compliance

- IEEE Specifications:
  - 802.1AS/1588-2008 PTPv2
  - 802.1q (VLAN)
  - 802.3-2015 (10Gb) Ethernet flow control
  - 802.3-2015 Clause 52 (10Gb Ethernet Optical)
  - 1588-2002 PTPv1 (Precision Time Protocol)
- SFF8431 Annex E (10Gb Direct Attach Copper)
- RFQs:
  - IPv4 (RFQ 791)
  - IPv6 (RFC 2460)

## RDMA Specifications

### Universal RDMA

- RoCE
- RoCEv2
- iWARP
- Storage over RDMA: iSER, SMB Direct, and NVMe™ over Fabrics
- NFSoRDMA

## Tools and Utilities

### Management Tools and Device Utilities

- QLogic® Control Suite integrated network adapter management utility (CLI) for Linux and Windows
- QConvergeConsole (QCC) integrated network management utility (GUI) for Linux and Windows
- QCC Plug-ins for vSphere (GUI) and ESXCLI plug-in for VMware
- QCC PowerKit (Windows PowerShell®) cmdlets for Linux and Windows
- Native OS management tools for networking

### Boot Support

- Unified extensible firmware interface (UEFI)
- Pre-execution environment (PXE)
- iSCSI remote boot

### APIs

- SNIA HBA API v2
- SMI-S

### Operating Systems

- For the latest applicable operating system information, see [Cavium.com](http://Cavium.com) **Downloads**

## Physical Specifications

### Ports

- Dual 10Gbps Ethernet: SFP28 cages

### Form Factor

- Low-profile PCIe card (6.60in. × 2.71in.)

## Environment and Equipment Specifications

### Temperature

- Operating: 0°C to 55°C (32°F to 131°F)
- Storage: -40°C to 65°C (-40°F to 149°F)

### Airflow

- 100LFM at 55°C with two 85C-rated optical SR transceivers

### Humidity

- Operating: 10% to 80%
- Storage: 5% to 90%

### Compliance

- RoHS compliant

### Connectivity

Rate	Cable and Maximum Distance (m)		
	DAC	SR FOC	AOC
10G	7	400 OM4 300 OM3	30

DAC = Direct attach cable  
SR FOC = SR fiber optic cable  
AOC = Active optical cable

## Agency Approvals—Safety

### US and Canada

- UL 60950-1
- CSA C22.2

### Europe

- TUV EN60950-1
- TUV IEC 60950-1
- CB Certified

#### Note:

All advertised features are enabled in the hardware. Actual feature availability is dependent on software driver releases. See the release notes.

Picture may not be representative of the final shipping product.

Agency Approvals<sup>1</sup>—EMI and EMC (Class A)

## US and Canada

- FCC Rules, CFR Title 47, Part 15, Subpart Class A
- Industry Canada, ICES-003: Class A

## Europe

- EN55032
- EN55024
- EN61000-3-2
- EN61000-3-3

## Japan

- VCCI: Class A

## New Zealand and Australia

- AS/NZS: Class A

## Korea

- KC-RRA Class A

## Taiwan

- BSMI CNS 13438

<sup>1</sup> Agency approvals have not been authorized at the time of publication; this list is preliminary.

## Ordering Information

QL41132HLCU-BK/SP/CK (dual-port, SFP28/direct-attach copper): Non-AVS<sup>2</sup> Adapter

- Bulk Kit (BK)
- Single-Pack (SP)
- Channel Kit (CK)

## QL41132HLCU-11-BK/SP/CK: AVS Enabled Adapter

<sup>2</sup> AVS is Adaptive Voltage Scaling.



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